

# TEST REPORT

**Application No.:** SHEM2002001019CR  
**FCC ID:** N82-KOHLER045  
**IC:** 4554A-KOHLER045  
**Applicant:** Kohler Co.  
**Address of Applicant:** 444 Highland Drive Kohler, WI 53044 United States  
**Manufacturer:** Shanghai Kohler Electronics., Ltd.  
**Address of Manufacturer:** No. 1955, Fengxiang Road, Baoshan Area, Shanghai, PRC Post code: 200444  
**Factory:** Shanghai Kohler Electronics., Ltd.  
**Address of Factory:** No. 1955, Fengxiang Road, Baoshan Area, Shanghai, PRC Post code: 200444

**Equipment Under Test (EUT):**  
**EUT Name:** NUMI2.0 remote controller  
**Model No.:** 1418125  
**Trade mark:** KOHLER  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.249  
RSS-210 Issue10, December 2019  
RSS-Gen Issue 5, March 2019 Amendment 1

**Date of Receipt:** 2020-02-21  
**Date of Test:** 2020-12-22 to 2020-12-27  
**Date of Issue:** 2020-12-28

<b>Test Result:</b>	<b>PASS*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

*Parlam Zhan*

Parlam Zhan  
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.


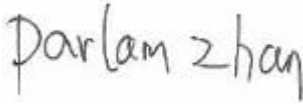


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Revision Record			
Version	Description	Date	Remark
00	Original	2020-12-28	/

Authorized for issue by:			
			
		<hr/>	
		Vincent Zhu / Project Engineer	
			
		<hr/>	
		Parlam Zhan / Reviewer	

## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	FCC Requirement	IC Requirement	Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	RSS-Gen Clause 6.8	N/A	Pass

Radio Spectrum Matter Part				
Item	FCC Requirement	IC Requirement	Method	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	RSS-Gen Section 6.7	ANSI C63.10 (2013) Section 6.9	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	RSS-210 Issue10 Annex B B.10	ANSI C63.10 (2013) Section 6.5&6.6	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	RSS-210 Issue10 Annex B B.10& RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4&6.5&6.6	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	RSS-210 Issue10 Annex B B.10& RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4&6.5&6.6	Pass
99% Bandwidth		RSS-Gen Section 6.7	ANSI C63.10 Section 6.9.3	Pass



### 3 Contents

	Page
1 COVER PAGE.....	1
2 TEST SUMMARY.....	3
3 CONTENTS.....	4
4 GENERAL INFORMATION .....	5
4.1 DETAILS OF E.U.T.....	5
4.2 DESCRIPTION OF SUPPORT UNITS.....	5
4.3 MEASUREMENT UNCERTAINTY .....	5
4.4 TEST LOCATION .....	5
4.5 TEST FACILITY .....	6
4.6 DEVIATION FROM STANDARDS .....	6
4.7 ABNORMALITIES FROM STANDARD CONDITIONS .....	6
5 EQUIPMENT LIST .....	7
6 RADIO SPECTRUM TECHNICAL REQUIREMENT .....	8
6.1 ANTENNA REQUIREMENT .....	8
7 RADIO SPECTRUM MATTER TEST RESULTS .....	9
7.1 20DB BANDWIDTH.....	9
7.2 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL (15.249(A)) .....	12
7.3 RESTRICTED BAND AROUND FUNDAMENTAL FREQUENCY .....	14
7.4 RADIATED EMISSIONS .....	20
7.5 99% BANDWIDTH.....	30
8 TEST SETUP PHOTOGRAPHS.....	33
9 EUT CONSTRUCTIONAL DETAILS.....	33

## 4 General Information

### 4.1 Details of E.U.T.

Power supply:	DC 4.5V by 3*AA battery
Test voltage:	DC 4.5V
Modulation Type	MSK
Number of Channels	8
Operation Frequency	2414.5MHz~2449.5MHz
Channel Spacing	5MHz
Antenna Type	PCB Antenna
Antenna Gain:	2.88dBi(Provided by the manufacturer)
S/N:	1418124XXXXXXXXXXXX1668412012110056
Firmware version:	V0.021

### 4.2 Description of Support Units

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$8.4 \times 10^{-8}$
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Radiated Power	5.1dB (Below 1GHz)
		4.9dB (Above 1GHz)
6	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
7	Temperature Test	1°C
8	Humidity Test	3%
9	Supply Voltages	1.5%
10	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

No tests were sub-contracted.

#### 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **NVLAP (LAB CODE: 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

- **FCC (Designation Number: CN5033)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory. Test Firm Registration Number: 479755.

- **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. ISED#: 8617A.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None

## 5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
<b>RF Conducted Test</b>					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2020-12-20	2021-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2020-08-13	2021-08-12
Signal Generator	R&S	SMR20	SHEM006-1	2020-08-13	2021-08-12
Signal Generator	Agilent	N5182A	SHEM182-1	2020-08-13	2021-08-12
Communication Tester	R&S	CMW270	SHEM183-1	2020-08-13	2021-08-12
Switcher	Tonscend	JS0806	SHEM184-1	2020-08-13	2021-08-12
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2020-08-13	2021-08-12
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2018-09-25	2021-09-24
AC Power Stabilizer	APC	KDF-31020T-V0-F0	SHEM216-1	2020-12-20	2021-12-19
DC Power Supply	MCH	MCH-303A	SHEM210-1	2020-12-20	2021-12-19
Conducted test Cable	/	RF01~RF04	/	2020-12-20	2021-12-19
Test software	Tonscend	JS Tonscend BT/WIFI System	Version: 2.6	/	/
<b>RF Radiated Test</b>					
EMI test Receiver	R&S	ESU40	SHEM051-1	2020-12-20	2021-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2020-12-20	2021-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2020-12-20	2021-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2019-10-14	2021-10-13
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2019-04-30	2021-04-29
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2018-10-24	2021-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2019-10-14	2021-10-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2018-10-31	2021-10-30
Pre-amplifier (9kHz-2GHz)	CLAVIO	BDLNA-0001	SHEM164-1	2020-08-13	2021-08-12
Pre-amplifier (1-18GHz)	CLAVIO	BDLNA-0118	SHEM050-2	2020-08-13	2021-08-12
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2020-12-20	2021-12-19
Signal Generator	R&S	SMR40	SHEM058-1	2020-08-13	2021-08-12
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2020-12-20	2021-12-19
Test software	ESE	E3	Version: 6.1112 21a	/	/

## **6 Radio Spectrum Technical Requirement**

### **6.1 Antenna Requirement**

#### **6.1.1 Test Requirement:**

47 CFR Part 15, Subpart C 15.203

Limit:

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### **6.1.2 Conclusion**

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is 2.88dBi.

Antenna location: Refer to Appendix (Internal Photos)



## 7 Radio Spectrum Matter Test Results

### 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215  
Test Method: ANSI C63.10 (2013) Section 6.9

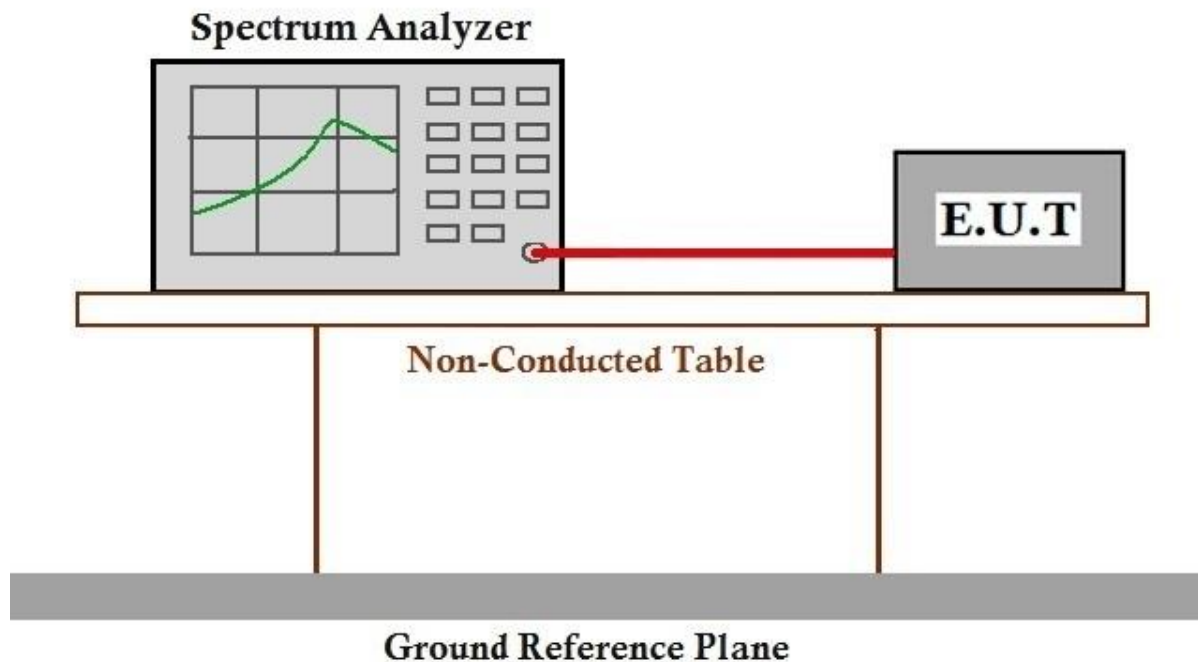
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.1.2 Test Setup Diagram



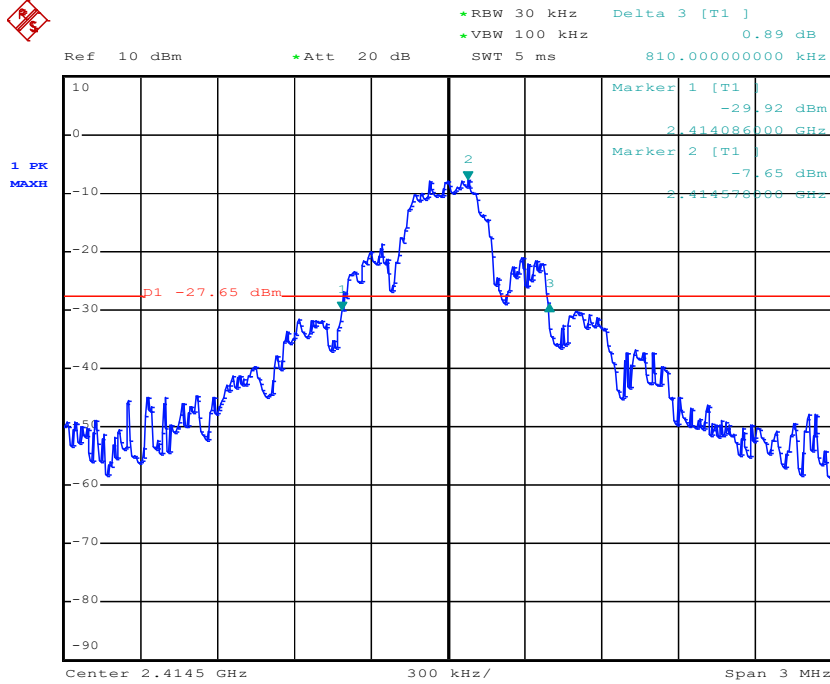
#### 7.1.3 Measurement Procedure and Data

1. Place the EUT on the table and set it in Engineering mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = approximately 1 % to 5 % of the OBW (set 30 kHz), VBW =3\* RBW, Span=3MHz, Sweep=auto
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured was complete.

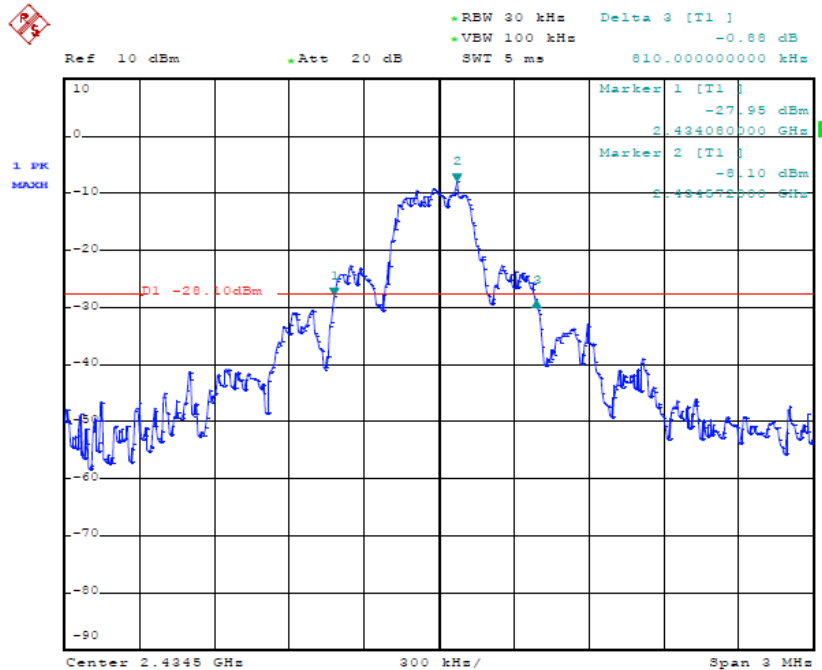
Frequency (MHz)	Bandwidth (MHz)	Result
2414.5	0.810	PASS
2434.5	0.810	PASS
2449.5	0.804	PASS

Test plot as follows:

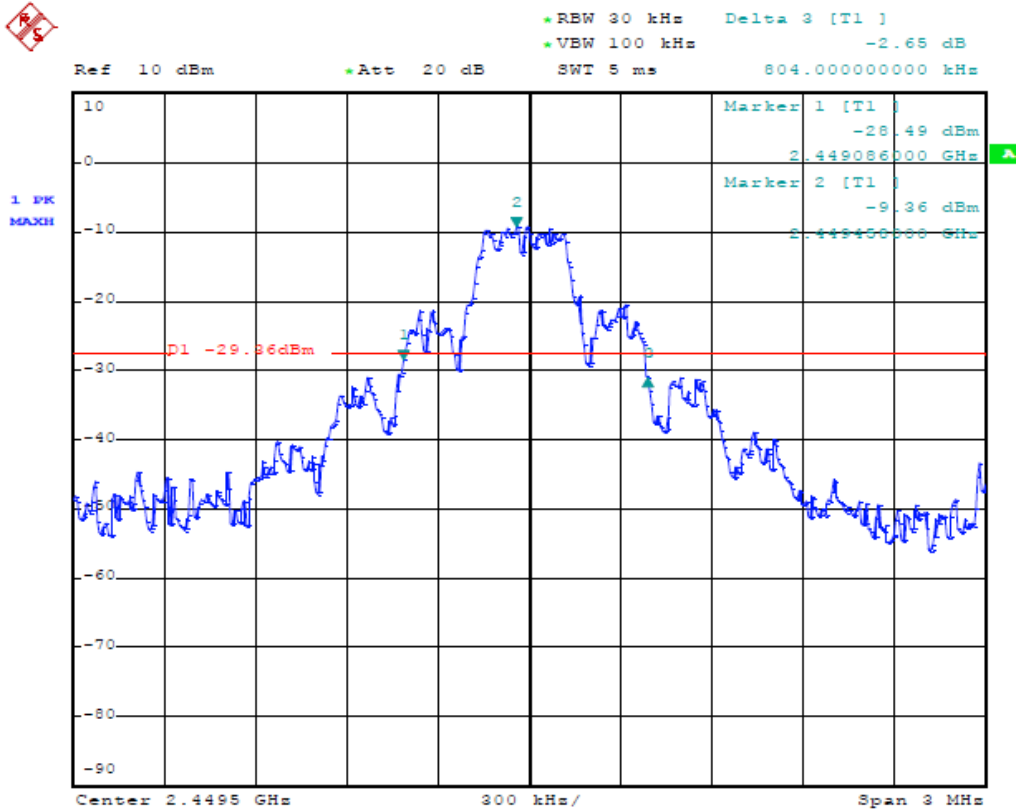
Channel: 2414.5MHz



Channel: 2434.5MHz



Channel: 2449.5MHz



## 7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement: 47 CFR Part 15, Subpart C 15.249(a)  
Test Method: ANSI C63.10 (2013) Section 6.5&6.6

**Test Site:** Measurement Distance: 3m

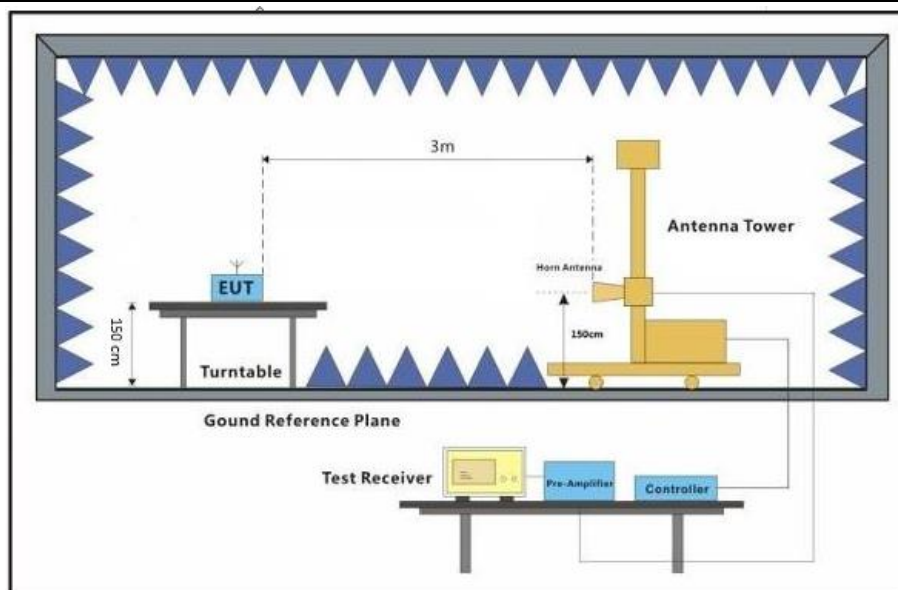
**Receiver Setup:**

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

**Limit:**

Frequency	Limit (dBuV/m)	Remark
2400~2483.5 MHz	114	Peak
	94	Average

**Test Setup:**



**Test Procedure:**

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

**Test Results:**

Pass

**Measurement Data**

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2414.5	92.05	-5.28	86.77	94	-7.23	Peak	Horizontal
	84.95	-5.28	79.67	94	-14.33	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2434.5	90.58	-5.3	85.28	94	-8.72	Peak	Horizontal
	84.8	-5.3	79.5	94	-14.5	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2449.5	91.96	-5.33	86.63	94	-7.37	Peak	Horizontal
	83.22	-5.33	77.89	94	-16.11	Peak	Vertical

Remark:

- 1) The basic equation with a sample calculation is as follows: Level = Read Level + Factor.  
**(The Factor is calculated by adding the Antenna Factor, Cable Loss and Preamp Factor)**
- 2) If the Peak value below the Average Limit, the Quasi-Peak test doesn't perform for this submission.

### 7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209  
 Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6  
 Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

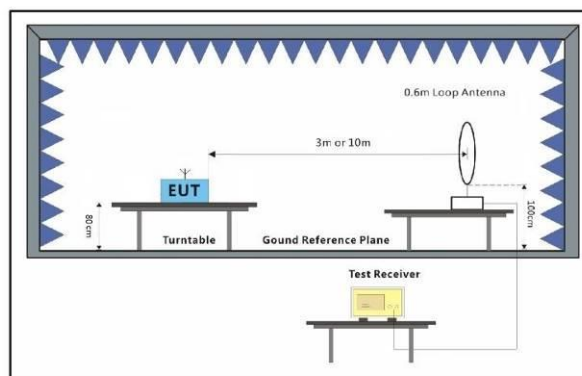
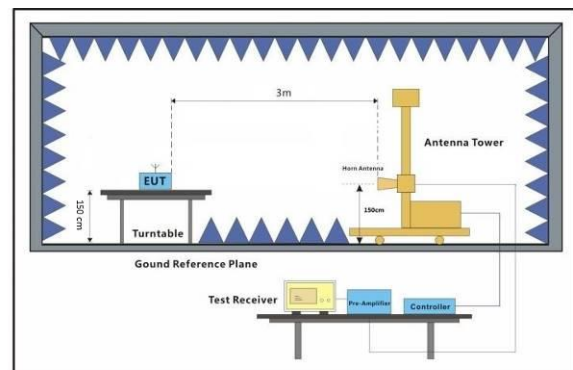
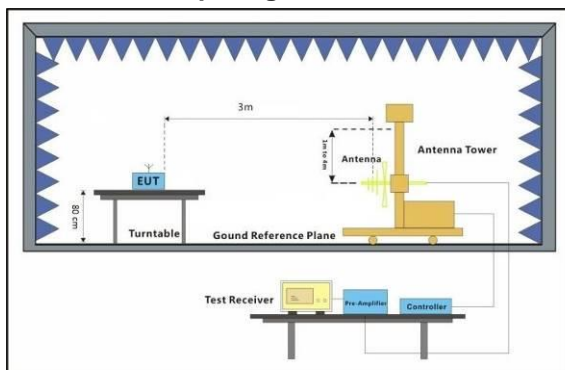
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar  
 Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.3.2 Test Setup Diagram



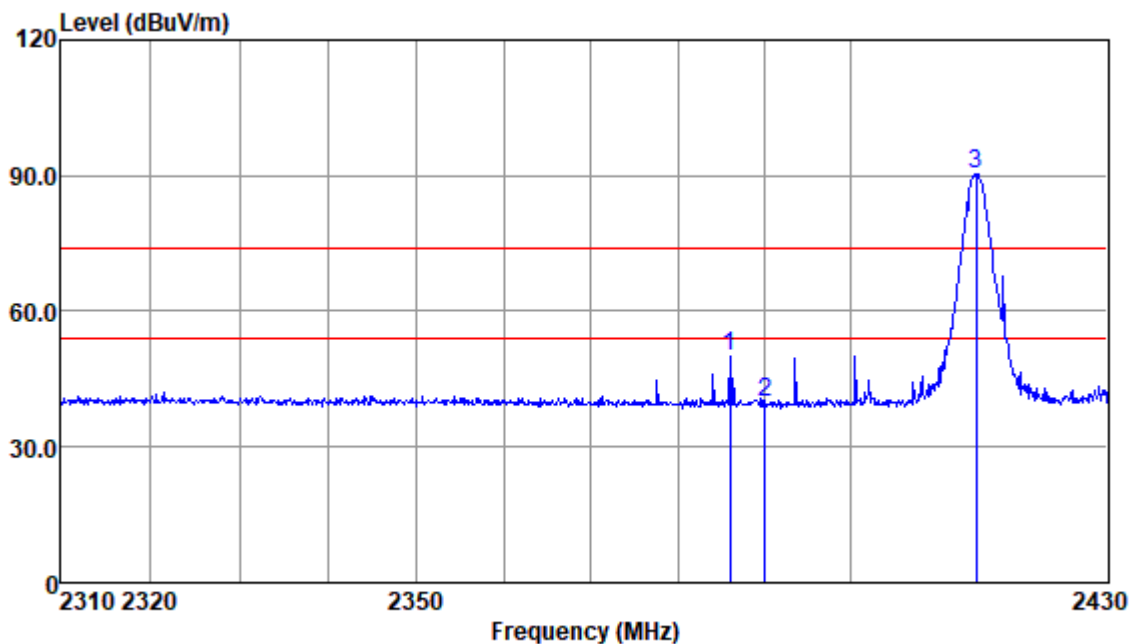
### 7.3.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1:  $Level = Read\ Level + Cable\ Loss + Antenna\ Factor - Preamp\ Factor$

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

2414.5MHz:

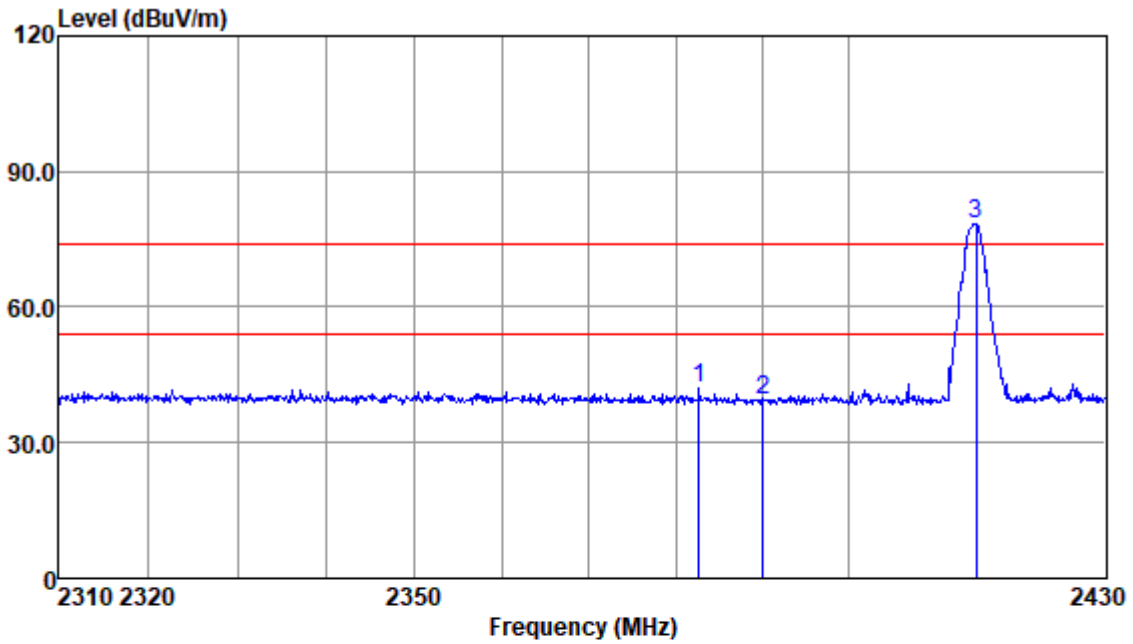


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2385.98	58.15	26.03	3.16	37.40	49.94	74.00	-24.06	Peak
2390.00	48.06	26.03	3.15	37.40	39.84	74.00	-34.16	Peak
2414.54	98.49	26.08	3.13	37.43	90.27	74.00	16.27	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



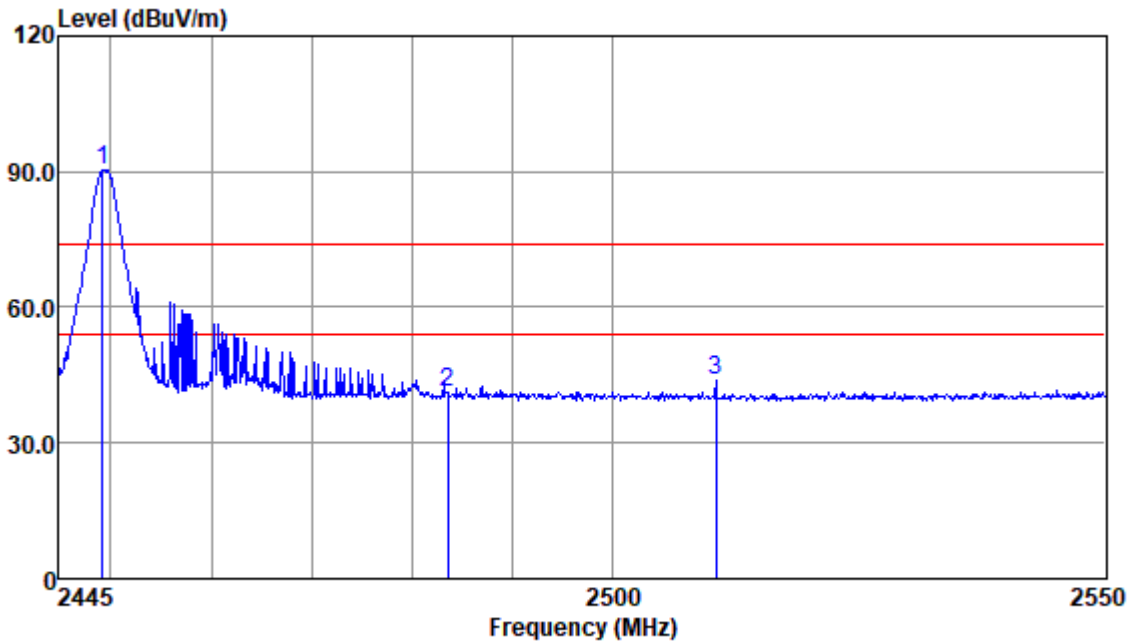


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2382.60	50.18	26.02	3.16	37.39	41.97	74.00	-32.03	Peak
2390.00	47.58	26.03	3.15	37.40	39.36	74.00	-34.64	Peak
2414.79	86.61	26.08	3.13	37.43	78.39	74.00	4.39	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

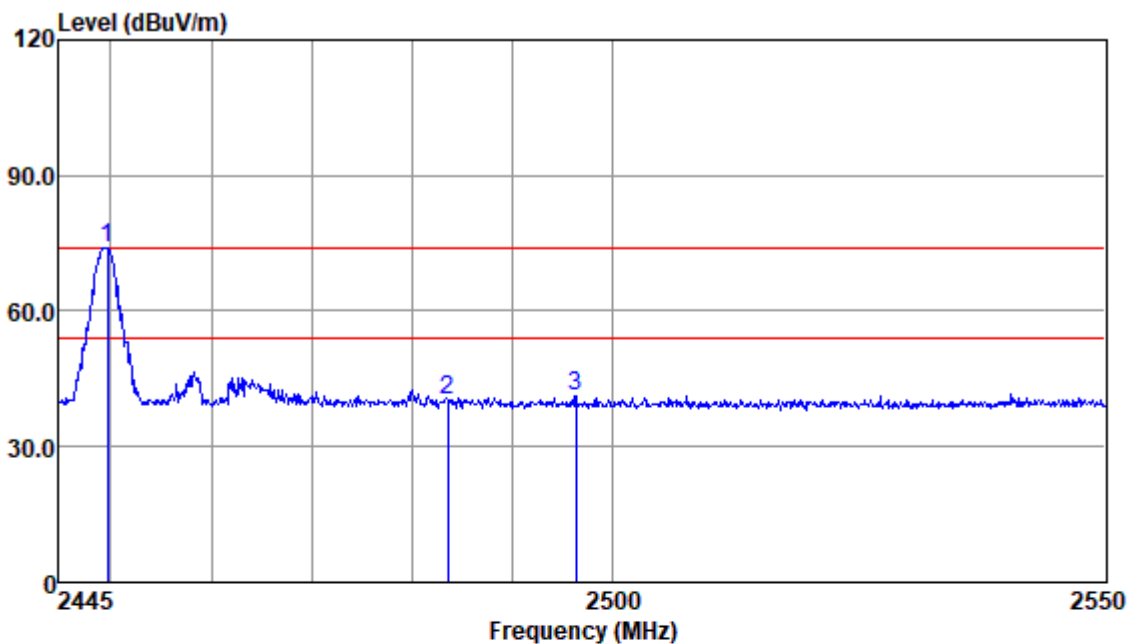
2449.5MHz:



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2449.32	98.54	26.13	3.13	37.50	90.30	74.00	16.30	Peak
2483.50	49.48	26.18	3.14	37.57	41.23	74.00	-32.77	Peak
2510.42	52.14	26.22	3.15	37.61	43.90	74.00	-30.10	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2449.73	82.37	26.13	3.13	37.50	74.13	74.00	0.13	Peak
2483.50	48.61	26.18	3.14	37.57	40.36	74.00	-33.64	Peak
2496.32	49.62	26.20	3.15	37.60	41.37	74.00	-32.63	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

### 7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)  
 Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6  
 Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

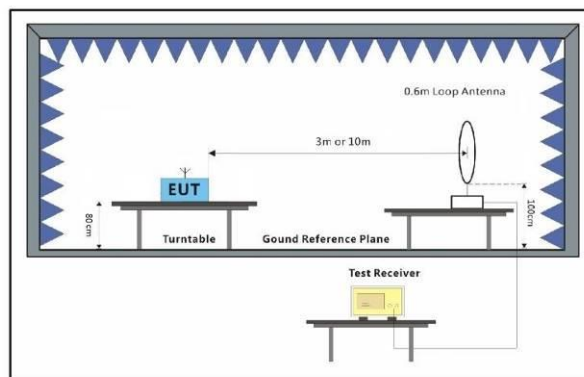
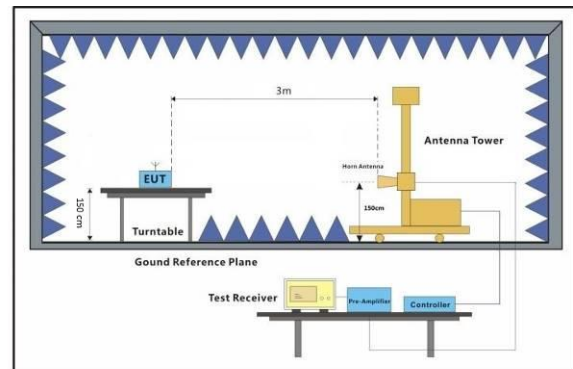
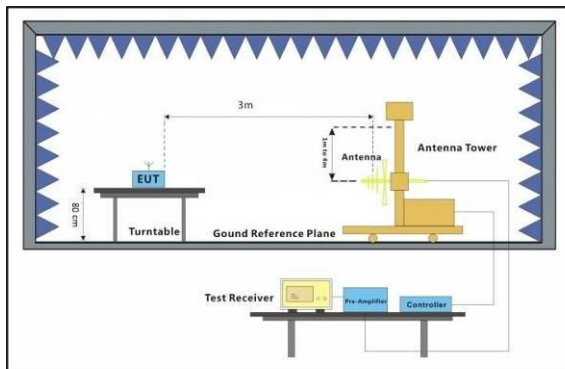
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar  
 Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.4.2 Test Setup Diagram



#### 7.4.3 Measurement Procedure and Data

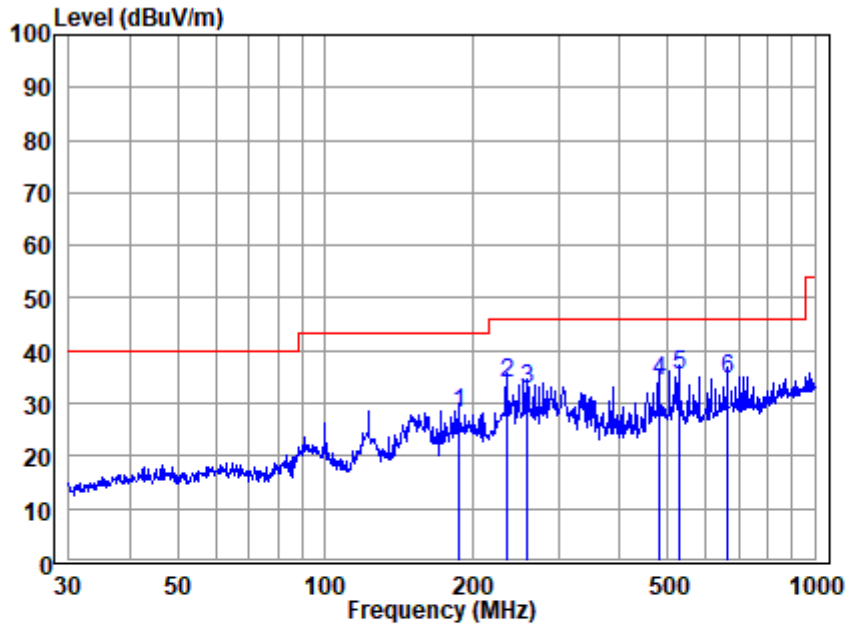
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

#### Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown

30MHz-1GHz:

Mode:a; Polarization:Horizontal

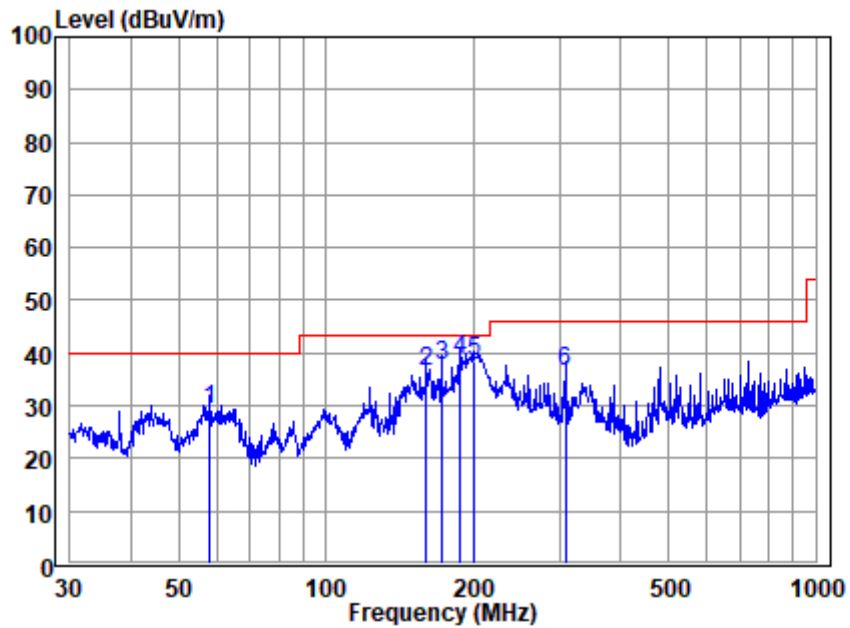


Antenna Polarity :Horizontal

	Read Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	187.10	41.09	11.35	2.45	26.70	28.19	43.50	-15.31	QP
2	234.99	46.49	11.00	2.91	26.49	33.91	46.00	-12.09	QP
3	258.33	44.23	12.00	2.99	26.47	32.75	46.00	-13.25	QP
4	480.53	39.84	17.94	4.36	27.75	34.39	46.00	-11.61	QP
5	528.25	39.25	19.22	4.76	27.89	35.34	46.00	-10.66	QP
6	663.47	36.45	20.81	5.47	28.02	34.71	46.00	-11.29	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Mode:a; Polarization:Vertical

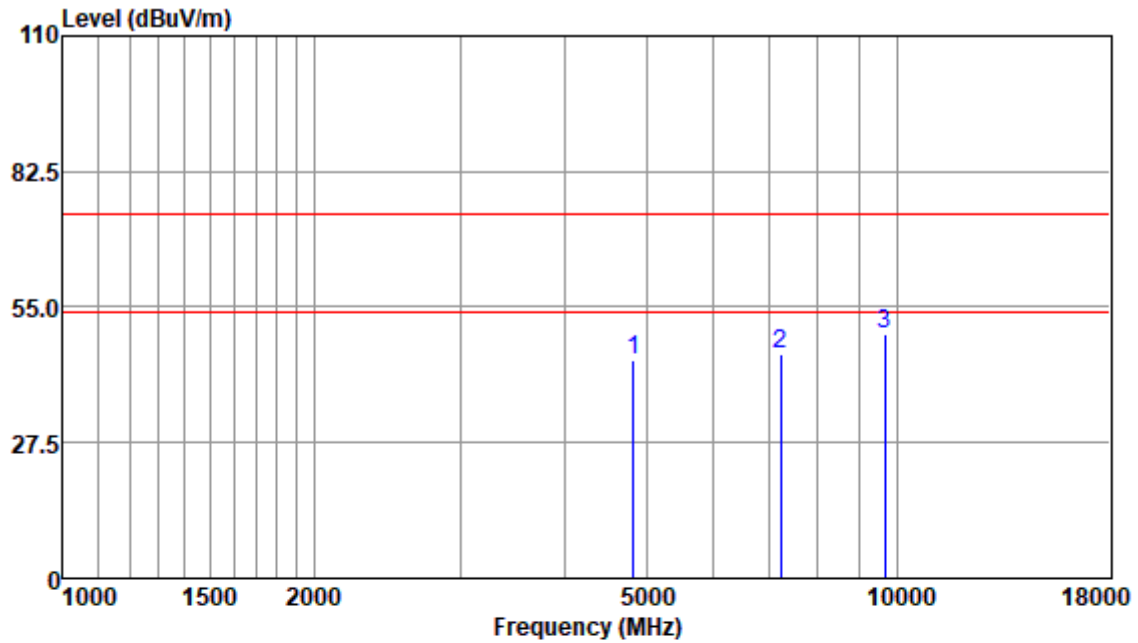


**Antenna Polarity :Vertical**

-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Read	Antenna	Cable	Preamp	Emission	Limit	Over			
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB		
1 58.00	42.05	12.80	1.35	27.11	29.09	40.00	-10.91	QP	
2 159.78	47.82	13.40	2.22	26.84	36.60	43.50	-6.90	QP	
3 171.99	49.71	12.52	2.29	26.80	37.72	43.50	-5.78	QP	
4 187.10	51.61	11.35	2.45	26.70	38.71	43.50	-4.79	QP	
5 199.99	52.45	10.00	2.62	26.67	38.40	43.50	-5.10	QP	
6 307.83	46.11	13.64	3.12	26.53	36.34	46.00	-9.66	QP	

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Above 1GHz:  
2414.5MHz:

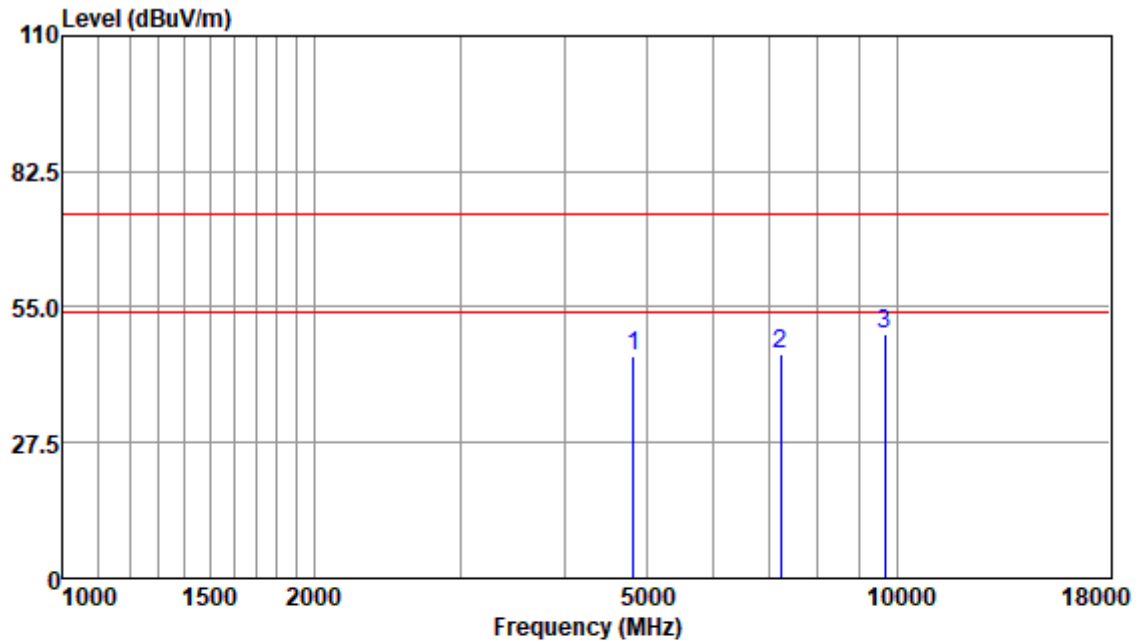


Antenna Polarity :HORIZONTAL

Read Freq	Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4829.00	44.26	33.83	4.89	38.73	44.25	74.00	-29.75	Peak
7243.50	40.59	36.35	5.78	37.16	45.56	74.00	-28.44	Peak
9658.00	39.37	37.74	6.65	34.17	49.59	74.00	-24.41	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor





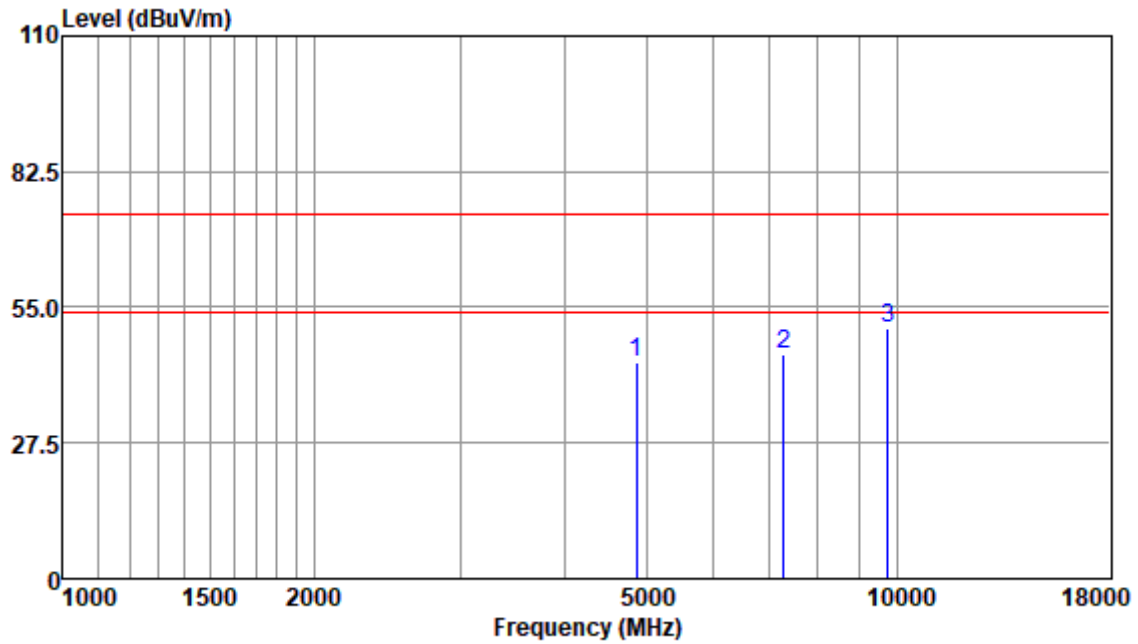
Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4829.00	44.99	33.83	4.89	38.73	44.98	74.00	-29.02	Peak
7243.50	40.61	36.35	5.78	37.16	45.58	74.00	-28.42	Peak
9658.00	39.35	37.74	6.65	34.17	49.57	74.00	-24.43	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



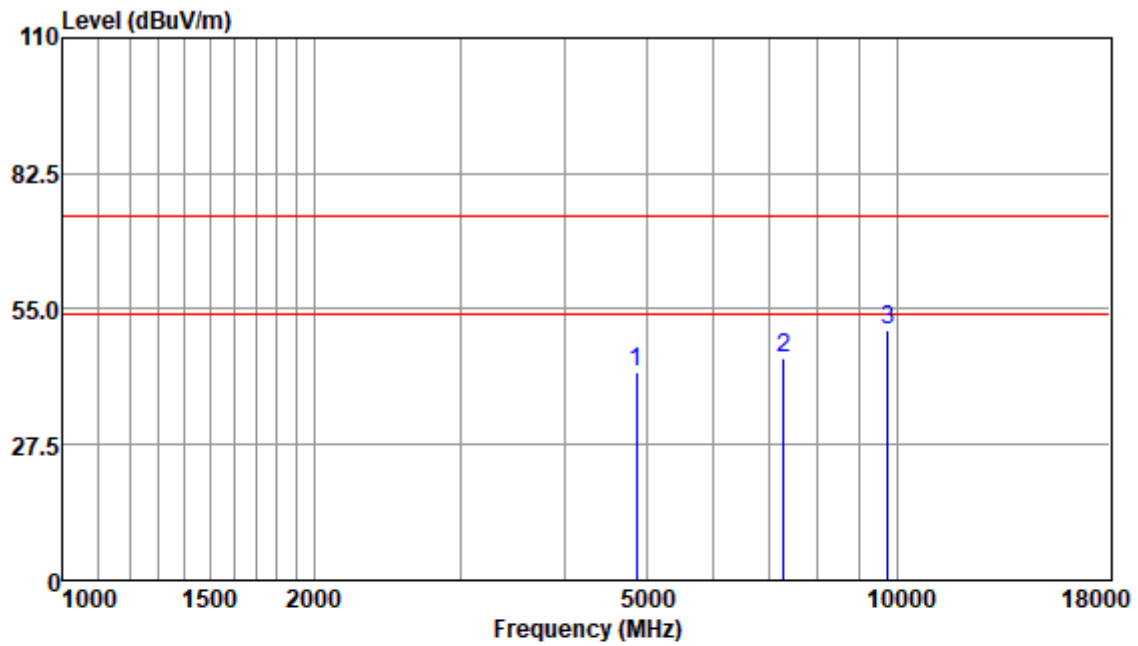
2434.5MHz:



Antenna Polarity :HORIZONTAL

Read Freq	Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4869.00	43.93	33.93	4.65	38.78	43.73	74.00	-30.27	Peak
7303.50	40.25	36.47	5.80	37.11	45.41	74.00	-28.59	Peak
9738.00	40.71	37.74	6.46	34.15	50.76	74.00	-23.24	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

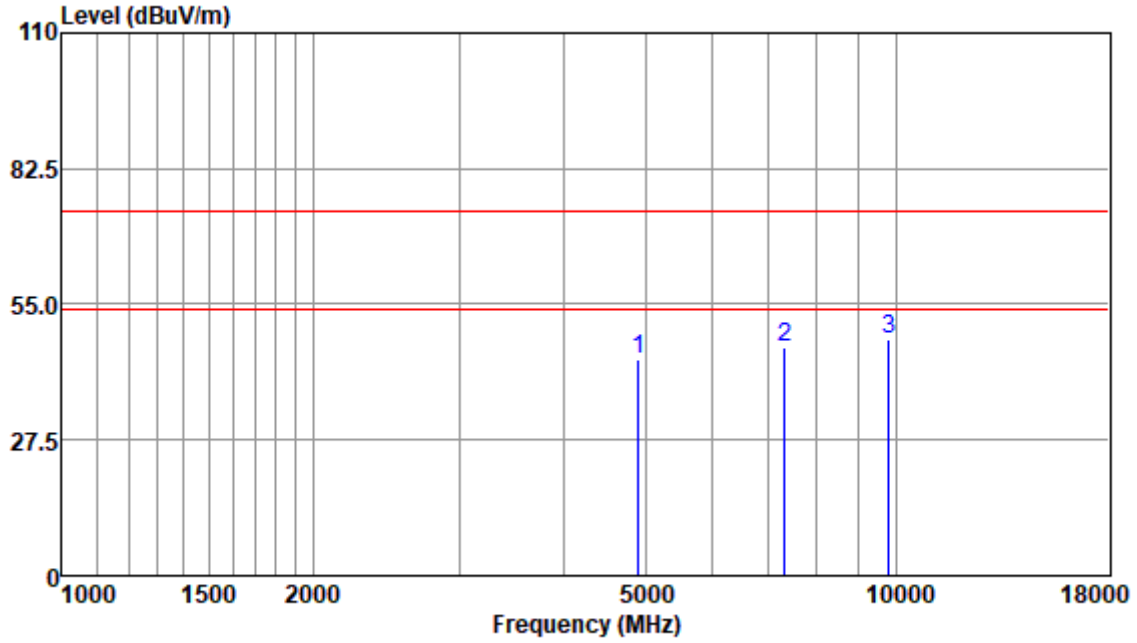


Antenna Polarity :VERTICAL

Read Freq	Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4869.00	42.35	33.93	4.65	38.78	42.15	74.00	-31.85	Peak
7303.50	39.85	36.47	5.80	37.11	45.01	74.00	-28.99	Peak
9738.00	40.86	37.74	6.46	34.15	50.91	74.00	-23.09	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

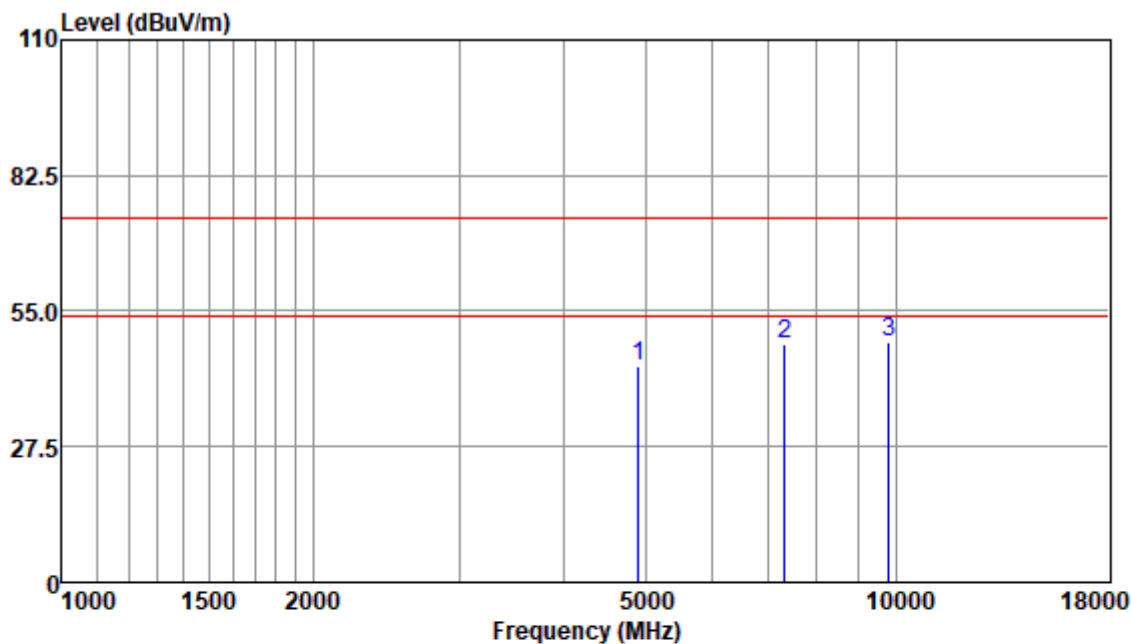
2449.5MHz:



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4899.00	44.55	33.97	4.30	38.80	44.02	74.00	-29.98	Peak
7348.50	40.55	36.47	6.17	37.09	46.10	74.00	-27.90	Peak
9798.00	38.10	37.55	6.50	34.14	48.01	74.00	-25.99	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Antenna Polarity :VERTICAL

Read Freq	Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4899.00	44.36	33.97	4.30	38.80	43.83	74.00	-30.17	Peak
7348.50	42.78	36.47	6.17	37.09	48.33	74.00	-25.67	Peak
9798.00	38.95	37.55	6.50	34.14	48.86	74.00	-25.14	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

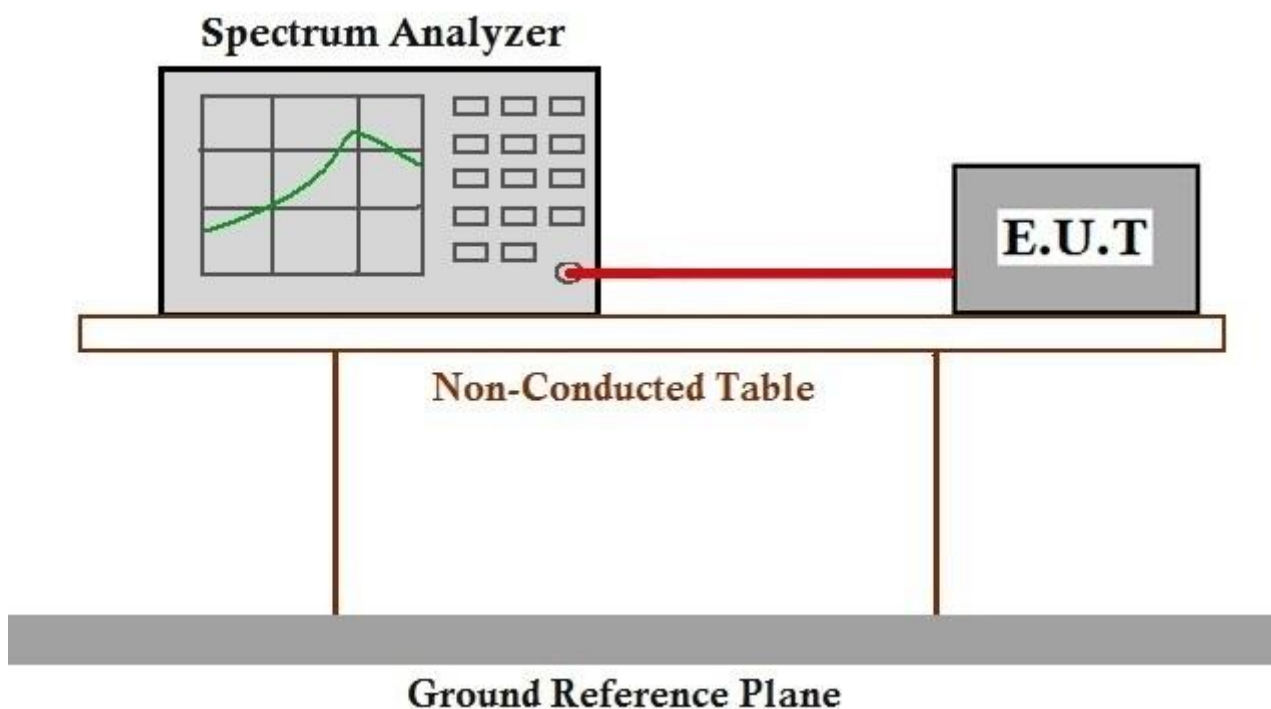
**7.5 99% Bandwidth**

Test Requirement RSS-Gen Section 6.7  
Test Method: RSS-Gen Section 6.7

**7.5.1 E.U.T. Operation**

Operating Environment:  
Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar  
Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

**7.5.2 Test Setup Diagram**



**7.5.3 Measurement Procedure and Data**

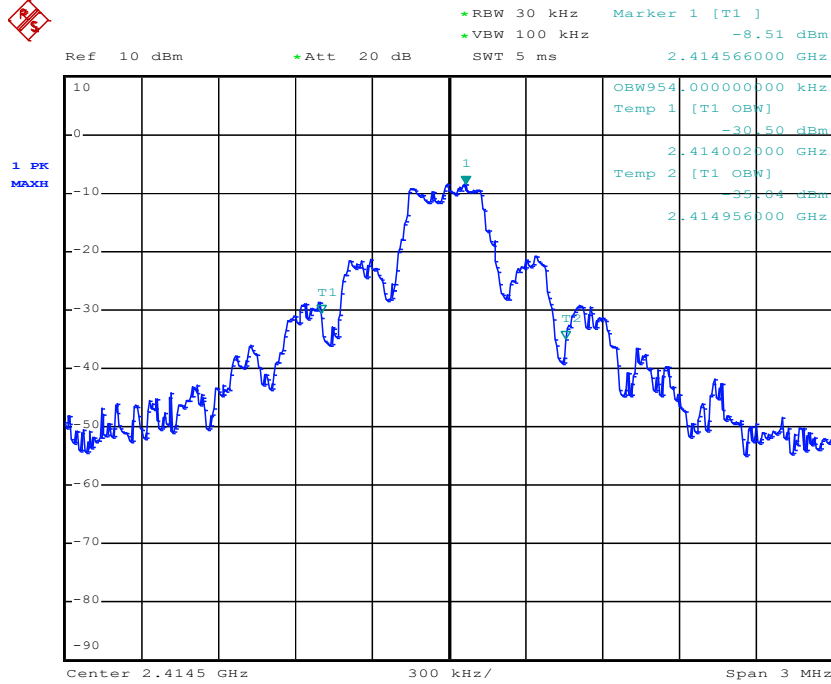
- 1.Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
- 2.Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centred on the hopping channel;
- 3.Set the spectrum analyzer: RBW = 1% of the span (set 30kHz). VBW >= RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
- 4.Mark the peak frequency and using the 99% OBW function measure the bandwidth.

Frequency (MHz)	Bandwidth (MHz)	Result
2414.5	0.954	PASS
2434.5	0.798	PASS
2449.5	0.804	PASS

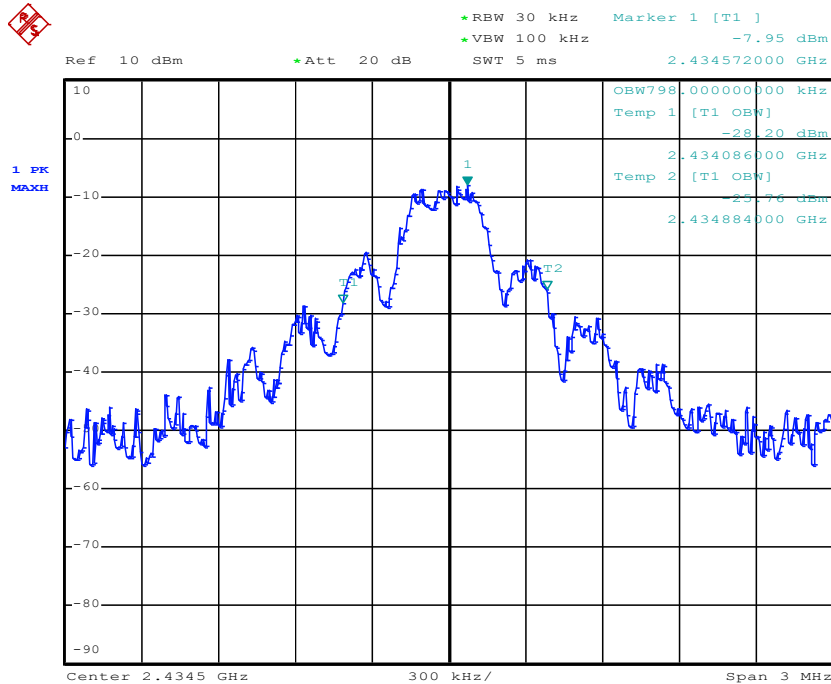


Test plot as follows:

Channel: 2414.5MHz

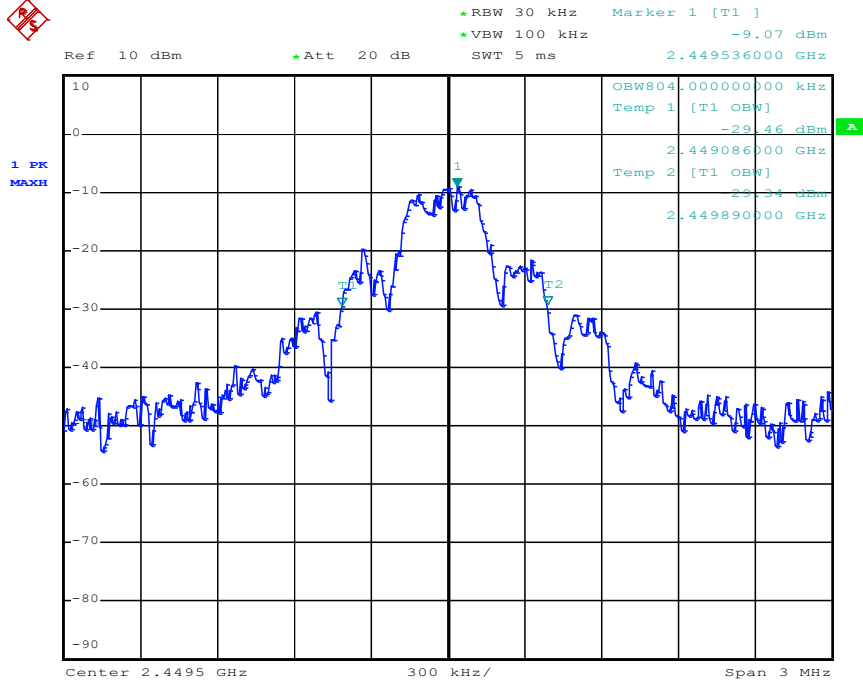


Channel: 2434.5MHz





Channel: 2449.5MHz







## **8 Test Setup Photographs**

Refer to the < Test Setup photos-FCC>.

## **9 EUT Constructional Details**

Refer to the < External Photos > & < Internal Photos >.

**- End of the Report -**